

SOME NOTES ON THE BIOLOGY OF *EUPHORIA INDA* (LINNÉ)
(COLEOPTERA: SCARABAEIDAE)

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This paper records a year's observations (IV-1975/V-1976) on *Euphoria inda* (Linné) in the areas of Ciudad Satélite (Estado de México) and Mexico City.

The habitat of *Euphoria inda* where studied is a good example of the exploitation of man-made conditions by an insect species.

Observation of behavior was done in the field under natural conditions. Some larva material was taken and reared in terraria with rich soil for obtaining pupae and adults. Specimens were killed in boiling water and preserved in 70% alcohol.

Ciudad Satélite is situated in the state of México, about 8 km to the NNW of Mexico City but in its metropolitan zone and in the spur of the Sierra de las Cruces (de las Cruces mountain range). It exemplifies the type of suburbs that began to appear in the late 50s around Mexico City.

Euphoria inda (Linné) has been observed to emerge in mid-April in Mexico City and in mid-May in Ciudad Satélite, coinciding with the first rains. By the end of June and beginning of July, one can find the dead adults in stacks of strawy litter. At the time of eclosion, the fields in Ciudad Satélite are covered mostly by grasses, particularly by *Andropogon barbinodis* Lagerini (Gramineae), which indicates that these fields were at some time in the past overgrazed by cattle. But there are also some dispersed stacks of fallen and dry grasses from the preceding dry season and great heaps of grass, leaves and plants, which accumulate regularly in the same spot throughout the year by gardeners who make the house-gardens near the fields.

E. inda is seen flying in the morning until midday, when they spend the hottest part of the day in the heaps of grass. They are again active in the afternoon. These beetles fly near the ground until they find a heap and then land on or very near to it. It has been noted that these artificial piles have much more attraction to the beetles than the natural ones; and the development of the larvae has only been seen in the artificial ones that develop rich soil under the exterior layer of dry vegetal debris.

In Mexico City *E. inda* has been observed to go to heaps of vegetal matter, clearly distinguishing between these and yellow spots of dry lawn. When the piles have been pulled apart with great care *E. inda* has been found singly or in pairs.



Fig. 1. An artificial heap of grass and leaves is seen against a house-wall.

In Ciudad Satélite a great number of adults are seen flying around the piles and although they make a very audible noise, I haven't observed birds or any arthropod preying on them.

In mid-June larvae of the second stage have been observed in the rich soil; in July larvae of the third stage and prepupae are found; in August larvae of the third stage, prepupae and pupae can be found; in September there are still larvae of the third stage, prepupae and pupae and in October there are larvae of the third stage, prepupae, pupae and adults; in January there are only adults. All these stages can be found at different depths depending on how thick the layer of rich soil is, I have found these stages to be from 4 to 17 cm deep. A behavioral characteristic that has been observed to be constant is that when the larva of the third stage is about to pupate, it migrates down to the limit between the rich soil and the mineral soil. These larvae have a great accumulation of excrement in the last part of their body, which can be clearly seen, since the end part of the body looks black. The excrement was analyzed and vegetal fibers and little pieces of non-digested vegetal tissue were found. I think this excrement is used for cementing the cocoon around the larva, since the prepupae presented none or almost no excrement left in the final part of the intestine.

The cocoon is made of mineral soil, it is oval shaped, is 17–20 mm in length and 13–15 mm in width, the wall is 1 mm thick and is smooth.



Fig. 2. General view of the suburban area of Ciudad Satélite. Houses mixed with fields.

Discussion

The larvae of *Euphoria inda* were compared with Ritcher's (1966) description. The larvae feed in rich soil, and Ritcher cited Bruner (1891) that adult *E. inda* in the U.S. were found to feed upon flowers and ripe fruit, such as apples, peaches and pears. I never found the adults of *E. inda* in flowers in Mexico City nor in Ciudad Satélite. *Euphoria basalis* (Gory & Percheron) was found in flowers in Mexico City and *E. basalis* and *Cotinis mutabilis* (Gory & Percheron) were found in flowers in Ciudad Satélite, the latter species has also been collected in Ciudad Satélite in traps baited with peaches, mangoes and bananas. Ritcher (1966) also reports that in Wisconsin the "adults were in flight from late August to September" and that the "winter is passed in the adult stage." Since the seasons around Mexico City are divided in one dry and cool epoch and a warm and rainy one, the behavior of *E. inda* is somewhat different, so the adults fly from May to June and pass the winter as adults in their cocoons.

The use of these artificial heaps of grass and leaves is an example of the exploitation of an environment created by man, this niche must certainly exist in natural conditions, but perhaps not in such an abundant and rich state and almost devoid of competition. Other types of animals were found associated with piles. There were found for example: Acarina, very small

ARaneae and Chilopoda, Gasteropoda, larvae and pupae of Lepidoptera, larvae and pupae of Diptera (which fed on the rich soil), there were adults of Staphylinidae, Histeridae and Aphodiinae (Scarabaeidae), some larvae and adults of Carabidae were found and there were also some Nematoda and many Isopoda. This fauna being so minute in relation to the size of *E. inda*, they can hardly present the danger of being predators of the beetle's larva. *Latrodectus mactans* (Araneae: Theridiidae) and *Calosoma laeve* Dejean (Coleoptera: Carabidae), which occur in the fields, could easily prey upon the larvae, but until now, they haven't been found in the heaps.

Sometimes the pupae were found dead inside their cocoons by some sort of milky disease, covered with fungus and sometimes with Nematoda inside their body cavities.

These straw piles maintain a more or less stable temperature and humidity throughout the year, serving as a climatic buffer.

The niche of vegetal heaps is very unstable, since it is man dependent. The moment will come, where there will be no fields left in Ciudad Satélite and the numbers of the population will diminish. The formation and colonization of the heaps is not too old, at least in Ciudad Satélite, where the first houses were built in 1957. These piles concentrate and support a high population density of *E. inda* and are a relative "competitive vacuum" as Pianka (1974) once wrote. There could also be the possibility that this species is found in the periphery of Mexico City associated with forestal or agricultural refuses.

Ritcher (1966) records the following general distribution of *E. inda* in the U.S.: "from Connecticut to Florida, and westward to Oregon and Arizona." Bates (1889) records the distribution in the U.S. as east of the Rocky Mountains and in México in Puebla and Chalchicomula (Sallé) in the state of Puebla, Guanajuato in the state of the same name, Zapotlán (Höge) in the state of Colima and in Mexico City. A. Hardy (1979, personal communication) has recorded it also from the states of Chihuahua, Durango, Hidalgo, Jalisco, México, Michoacan, Morelos, Sinaloa and Veracruz and in the south of Canada.

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Literature Cited

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- Pianka, Eric R. 1974. *Evolutionary Ecology*. Harper & Row Publishers, Inc., New York, 356 pp.
- Ritcher, Paul O. 1966. *White Grubs and Their Allies*. Studies in Entomology Number Four. Oregon State University Press, Oregon, 219 pp.

 BOOK REVIEW

Beetles From the Early Russian Exploration of the West Coast of North America 1815–1857. E. G. Linsley, editor, Intro. by Keir B. Sterling. Arno Press, New York, pages unnumbered, but approximately 540 pp. \$40.00, hardbound.

In recent years there has been a decline on the commercial market of original material of reprint form of older scientific literature. The disadvantage to workers who are attempting to build libraries in their respective specialities has been partially overcome by the rapid advancements in the field of copier technology. This, however, is of use only if an original copy of the work can be located. Many important works are rare, and there are only a few copies in existence, which may not be available for reproduction.

The book reviewed here is of decided importance since it helps bridge this gap by bringing together papers from a number of rare or difficult to obtain sources and reprints them. Editor Linsley has selected eight of the most significant papers dealing with Coleoptera collected during 1812 to 1841, when the Western United States was a Russian Colony. The collection contains papers by C. G. Mannerheim (6), E. Ménétriés (1) and V. I. Motschulsky (1). With this work in hand the only significant descriptive literature on Coleoptera from this material a researcher would lack would be the papers by J. F. Eschscholtz (1822, *Entomographien*; 1829, 1831, 1833, *Zoologischen Atlas . . .*) and those of P. F. M. A. Dejean (1837, *Catalogue des Coléoptères . . .*, etc.)

As indicated above, the book is a reprint of eight papers, each preserved with the original pagination and type font (including an interesting typo in the first word of the second article). The introduction by Sterling is interesting, but, unfortunately, brief. The binding is excellent and attractive.

The volume should prove invaluable to systematists working on the North American fauna. We look forward to other titles in Arno Press' "Biologists and Their World" series.

A. R. Hardy, Co-editor.